EGU21-10329, updated on 19 Sep 2021
https://doi.org/10.5194/egusphere-egu21-10329
EGU General Assembly 2021

Atmospheric Turbulence and Clouds in the Tropics: Shipborne Lidar Measurements of Dynamics and Thermodynamics During EUREC4A

Diego Lange[1], Andreas Behrendt[1], Christoph Senff[2], Florian Späth[1], and Volker Wulfmeyer[1]
[1]University of Hohenheim, Institute of Physics and Meteorology, Stuttgart, Germany (diego.lange@uni-hohenheim.de)
[2]Earth System Research Laboratory - National Oceanic and Atmospheric Administration (NOAA), Boulder CO, USA

During the EUREC4A campaign (Bony et al., 2017, Stevens et al, 2020), a unique combination of lidar systems was operated to study ocean-atmosphere interaction on the German research vessel R/V Maria S Merian between 18 January and 18 February 2020. These systems observed the maritime boundary layer (MBL) and its relation to cloud development in the trade wind alley east of Barbados and in the "Boulevard des Tourbillons" east of Venezuela with turbulence resolving resolution.

For this purpose, for the first time, the Atmospheric Raman Temperature and Humidity Sounder (ARTHUS) (Lange et al. 2019; Lange et al. this conference) was operated on a shipborne platform in vertically staring mode. This system is capable of measuring water-vapor, temperature, and aerosol profiles with unprecedented resolution of 7.5 m and 10 s in the lower troposphere. ARTHUS was combined with one Doppler lidar in vertically staring mode and a second one in a 6-beam scanning mode.

For studying the above mentioned processes, a data set was collected, which includes profiles of water vapor mixing ratio, temperature, relative humidity, vertical and horizontal wind as well as the statistics of higher-order moments of these parameters. Synergetic parameters from the combination of the data are turbulent kinetic energy (TKE), momentum flux, dissipation rate, sensible and latent heat flux profiles (Behrendt et al. 2020). At the conference, highlights of the measurements will be presented which show the dependence of cloud evolution on sea surface temperature and MBL properties as well as the interaction with the trade wind layer.

References

Behrendt et al. 2020, https://doi.org/10.5194/amt-13-3221-2020

Bony et al. 2017, https://doi.org/10.1007/s10712-017-9428-0

Lange et al. 2019, https://doi.org/10.1029/2019GL085774